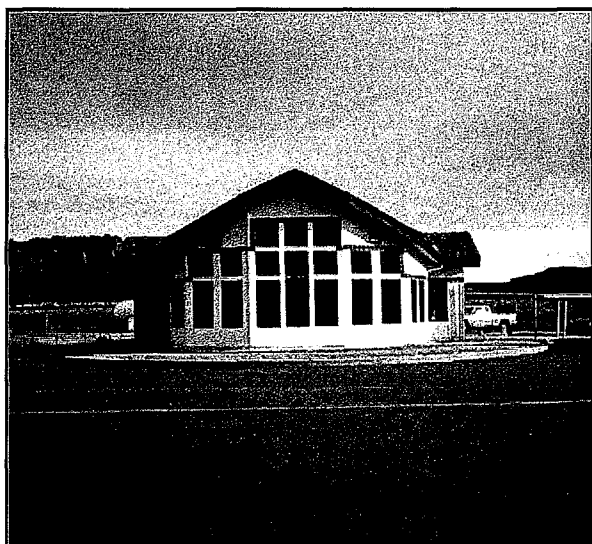




Chapter Three **AVIATION FACILITY REQUIREMENTS**

AVIATION FACILITY REQUIREMENTS



To properly plan for the future of Colorado City Municipal Airport, it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve this identified demand. This chapter uses the results of the forecasts conducted in Chapter Two, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting), and landside (i.e., hangars and aircraft parking apron) facility requirements.

The objective of this analysis is to identify, in general terms, the adequacy of the existing airport facilities, outline what new facilities may be needed, and

when these may be needed to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated in Chapter Four to determine the most cost-effective and efficient means for implementation.

Recognizing that the need to develop facilities is determined by demand, rather than a point in time, the requirements for new facilities have been expressed for the short, intermediate, and long term planning horizons, which roughly correlate to five-year, ten-year, and twenty-year timeframes. Future facility needs will be related to these activity levels rather than a specific year. **Table 3A** summarizes the activity levels that define the planning horizons used in the remainder of this master plan.

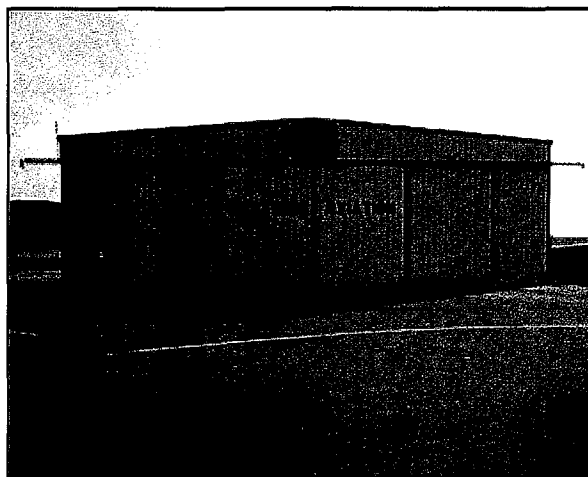


TABLE 3A
Planning Horizon Activity Levels

	Short Term Planning Horizon	Intermediate Term Planning Horizon	Long Term Planning Horizon
Based Aircraft	16	20	30
Annual Operations	5,600	7,500	13,500

AIRFIELD REQUIREMENTS

Airfield requirements include the need for those facilities related to the arrival and departure of aircraft. These facilities are comprised of the following items:

- Runways
- Taxiways
- Navigational Aids
- Airfield Marking and Lighting

The following airfield facilities are outlined to describe the scope of facilities that would be necessary to accommodate the airport's role throughout the planning period.

RUNWAYS

The adequacy of the existing runway system at Colorado City Municipal Airport has been analyzed from a number of perspectives, including airfield capacity, runway orientation, runway length, and pavement strength. From this information, requirements for runway improvements have been determined for the airport.

Airfield Capacity

A demand/capacity analysis measures the capacity of the airfield facilities (i.e. runways and taxiways) in order to identify a plan for additional development needs. The capacity of the airfield is affected by several factors including airfield layout, meteorological conditions, aircraft mix, runway use, aircraft arrivals, aircraft touch-and-go activity, and exit taxiway locations. An airport's airfield capacity is expressed in terms of its annual service volume. Annual service volume is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year.

Pursuant to FAA guidelines detailed in the FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, the annual service volume of an intersecting runway configuration similar to that of Colorado City Municipal Airport normally exceeds 230,000 operations. Since the forecasts for the airport indicate that the activity throughout the planning period will reach 13,500 annual operations, the capacity of the existing airfield system will not be reached, and the airfield can meet operational demands.

Physical Planning Criteria

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use the airport. Planning for future aircraft use is of particular importance since design standards are used to plan separation distances between facilities. These standards must be determined now since the relocation of these facilities will likely be extremely expensive at a later date.

The most important characteristics in airfield planning are the approach speed and wingspan of the critical design aircraft anticipated to use the airport now or in the future. The critical design aircraft is defined as the most demanding category of aircraft which conducts 500 or more operations per year at the airport.

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This code, the Airport Reference Code (ARC), has two components: the first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to

separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more, but less than 121 knots.

Category C: Speed 121 knots or more, but less than 141 knots.

Category D: Speed 141 knots or more, but less than 166 knots.

Category E: Speed greater than 166 knots.

The airplane design group (ADG) is based upon the aircraft's wingspan. The six ADG's used in airport planning are as follows:

Group I: Up to but not including 49 feet.

Group II: 49 feet up to but not including 79 feet.

Group III: 79 feet up to but not including 118 feet.

Group IV: 118 feet up to but not including 171 feet.

Group V: 171 feet up to but not including 214 feet.

Group VI: 214 feet or greater.

Exhibit 3A summarizes common aircraft by ARC. ARC B-II design standards were applied to the design and construction of Runway 11-29. ARC B-I design standards were applied

to the design and construction of Runway 2-20.

In order to determine future facility needs, an ARC should first be determined, then appropriate airport design criteria can be applied. This begins with a review of the type of aircraft using and expected to use Colorado City Municipal Airport through the planning period.

Common piston engine, turboprop, and jet general aviation aircraft, as well as their approach speed, wingspan, maximum takeoff weight, and ARC are summarized in **Table 3B**. The Colorado City Municipal Airport is currently utilized by all types of general aviation aircraft ranging from small single-engine piston aircraft to the occasional turboprop and business jet aircraft. The turboprop and business jets are the most demanding aircraft to operate at the airport. According to Town staff, the airport averages one business jet a week (2 weekly operations, 104 annual operations).

The owner of a Gulfstream G-III (ARC C-II) has expressed interest in basing at Colorado City Municipal Airport. Presently, Colorado City Municipal Airport receives limited use by business jet aircraft in the C-I or C-II ARC. To regularly accommodate Approach Category C aircraft requires a significant upgrade in clearances and safety standards. While the potential exists for business turboprop and jet aircraft within Approach Category C to use the airport, it will be unlikely that these aircraft will comprise at least 500 annual operations at the airport (even with a based aircraft in this category).

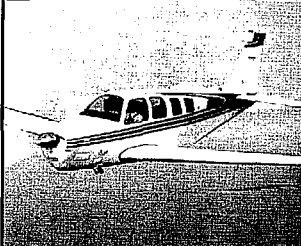
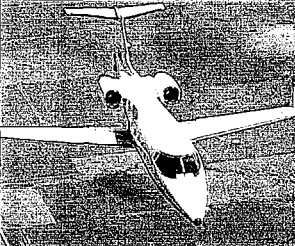

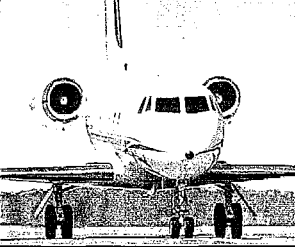

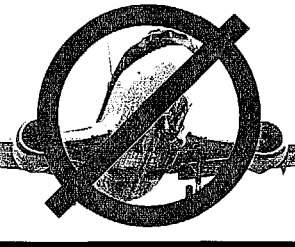
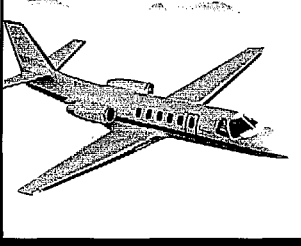

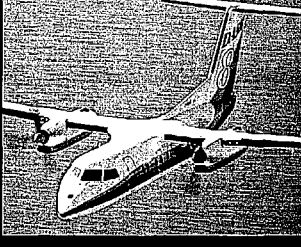
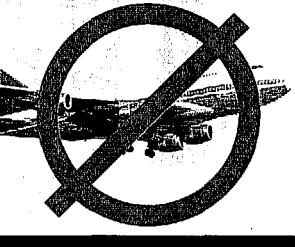
Without this minimum level of operations, it is difficult to justify developing Colorado City Municipal Airport to Approach Category C standards now or in the future.

As evidenced by **Table 3B**, the airport can still serve the full range of propeller aircraft as well as many business jet aircraft by maintaining the present ARC B-II design standards for Runway 11-29. (As mentioned previously, maintaining a B-II ARC for Runway 11-29 does not preclude operations by aircraft in Approach Category C.) Since Runway 2-20 safely accommodates smaller aircraft during crosswind conditions, the less demanding ARC of B-I can be retained for the design of this runway. Landside elements should consider FAA design criteria for ADG II to ensure adequate clearances between facilities and aircraft operating areas.

Runway Orientation

The airport is presently served by two intersecting runways: Runway 11-29 oriented in a southeast-northwest direction and Runway 2-20 oriented in a northeast-southwest direction. For the operational safety and efficiency of an airport, it is desirable for the principal runway of an airport's runway system to be oriented as close as possible to the direction of the prevailing wind. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off (defined as a crosswind).

FAA design standards specify that additional runway configurations are needed when the primary runway

 <p>A-I</p>	<p>Beech Baron 55 Beech Bonanza Cessna 150 Cessna 172 Piper Archer Piper Seneca</p>	 <p>C-I, D-I</p>	<p>Lear 25, 35, 55 Israeli Westwind HS 125</p>
 <p>B-I less than 12,500 lbs.</p>	<p>Beech Baron 58 Beech King Air 100 Cessna 402 Cessna 421 Piper Navajo Piper Cheyenne Swearingen Metroliner Cessna Citation I</p>	 <p>C-II, D-II</p>	<p>Gulfstream II, III, IV Canadair 600 Canadair Regional Jet Lockheed JetStar</p>
 <p>B-II less than 12,500 lbs.</p>	<p>Super King Air 200 Cessna 441 DHC Twin Otter</p>	 <p>C-III, D-III</p>	<p>B 727-200 B 737-200 B 737-300, 400, 500 DC-9 Fokker 70, 100 MD-80 A320</p>
 <p>B-I, II over 12,500 lbs.</p>	<p>Super King Air 300 Beech 1900 Jetstream 31 Falcon 10, 20, 50 Falcon 200, 900 Citation II, III, IV, V Saab 340 Embraer 120</p>	 <p>C-IV, D-IV</p>	<p>B-757 B-767 DC-8-70 DC-10 MD-11 L1011</p>
 <p>A-III, B-III</p>	<p>DHC Dash 7 DHC Dash 8 DC-3 Convair 580 Fairchild F-27 ATR 72 ATP</p>	 <p>D-V</p>	<p>B-747 Series B-777</p>

configuration provides less than 95 percent wind coverage at specific crosswind components. The 95 percent wind coverage is computed on the basis of crosswinds not exceeding 10.5 knots for small aircraft weighing less than 12,500 pounds and from 13 to 20 knots for aircraft weighing over 12,500 pounds.

A wind analysis was conducted for the previous master plan to determine the optimal runway configuration for the airport. This analysis, using local wind data recorded at the Colorado City Sewage Treatment Plant, revealed that a single runway configuration could not provide the minimum FAA wind coverage. From this wind data information, it was determined that the existing intersecting runway configuration provided the best wind coverage. **Exhibit 3B** summarizes wind coverage for the airport and provides a depiction of the airport windrose.

Airfield Design Standards

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions that could affect the safe operation of aircraft. These include the object free area (OFA), runway safety area (RSA), and runway protection zone (RPZ).

The OFA is defined as "a two dimensional ground area surrounding runways, taxiways, and taxilanes which is clear of objects except for objects whose location is fixed by function." The runway safety area (RSA) is

defined as "a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." The RPZ is defined as an area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape and centered about the extended runway centerline. The dimensions of an RPZ are a function of the runway ARC and approach visibility minimums.

Table 3C summarizes the dimensions of these safety areas by ARC. The FAA expects these areas to be under the control of the airport. A review of current airport drawings indicates that ARC B-I RSA, OFA, and RPZ standards for Runway 2-20 are fully met on existing airport property. Additionally, ARC B-II RSA, OFA, and RPZ standards for Runway 11-29 are full met on airport property as well. As evidenced in the table, upgrading to a C-II ARC increases airfield safety area dimensional standards. These standards could not be fully met at the airport site without acquiring additional property to control these surfaces.

Runway Length

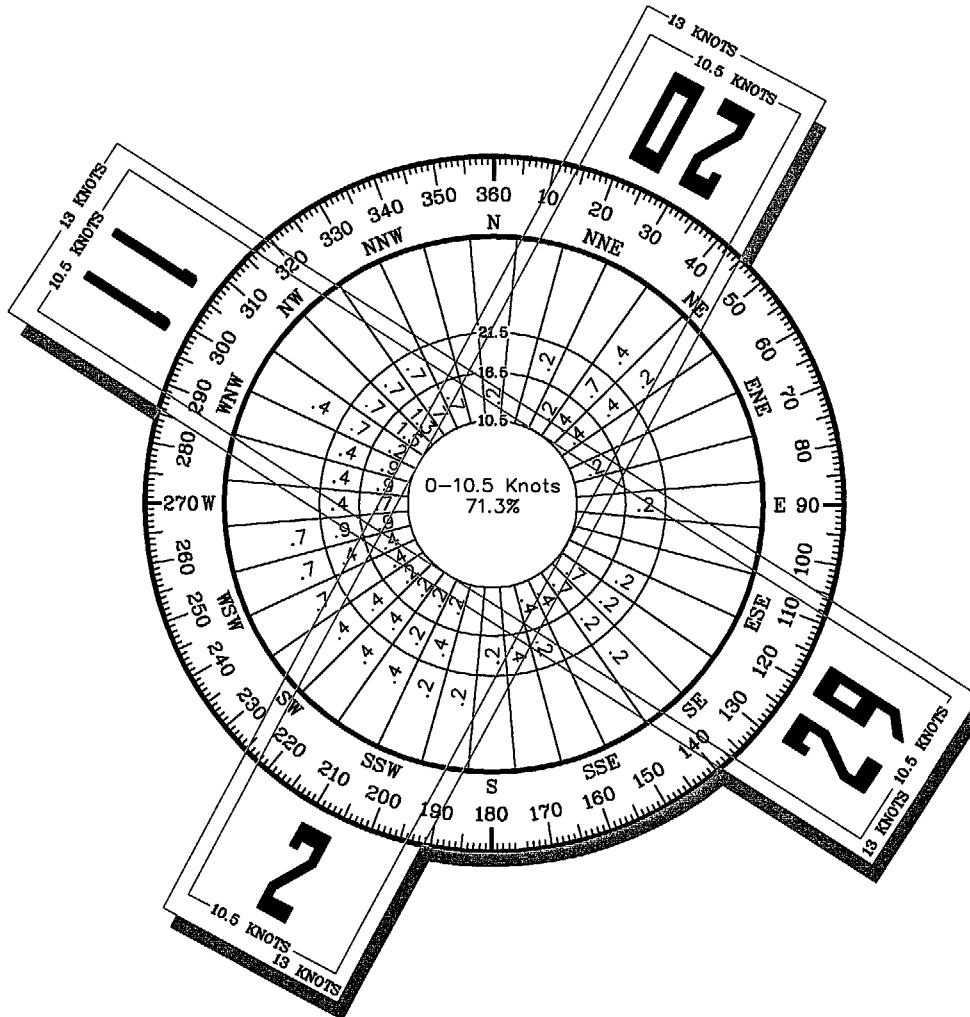
The determination of runway length requirements for an airport are based on five primary factors: airport elevation; mean maximum temperature of the hottest month; runway gradient (difference in elevation of each runway end); critical aircraft type expected to use the airport, and stage length of the longest nonstop trip destinations.

TABLE 3B
Representative General Aviation Aircraft by Airport Reference Code

Airport Reference Code	Typical Aircraft	Approach Speed (knots)	Wingspan (feet)	Maximum Takeoff Weight (lbs.)
A-I	Single-Engine Piston Cessna 150	55	32.7	1,600
A-I	Cessna 172	64	35.8	2,300
A-I	Beechcraft Bonanza	75	37.8	3,850
A-II	Turboprop Cessna Caravan	70	52.1	8,000
B-I	Multi-Engine Piston Beechcraft Baron 58	96	37.8	5,500
B-I	Piper Navajo	100	40.7	6,200
B-I	Cessna 421	96	41.7	7,450
B-I	Turboprop Mitsubishi MU-2	119	39.2	10,800
B-I	Piper Cheyenne	119	47.7	12,050
B-I	Beechcraft King Air B-100	111	45.8	11,800
B-I	Business Jets Cessna Citation I	108	47.1	11,850
B-I	Falcon 10	104	42.9	18,740
B-II	Turboprop Beechcraft Super King Air	103	54.5	12,500
B-II	Cessna 441	100	49.3	9,925
B-II	Business Jets Cessna Citation II	108	51.7	13,330
B-II	Cessna Citation III	114	53.5	22,000
B-II	Cessna Citation Bravo	114	52.2	15,000
B-II	Cessna Citation Excel	114	55.7	19,400
B-II	Cessna Citation Ultra	109	52.2	16,500
B-II	Falcon 20	107	53.5	28,660
B-II	Falcon 900	100	63.4	45,500
C-I	Business Jets Learjet 55	128	43.7	21,500
C-I	Rockwell Sabre 75A	137	44.5	23,300
C-I	Learjet 25	137	35.6	15,000
C-II	Turboprop Rockwell 980	121	52.1	10,325
C-II	Business Jets Canadair Challenger	125	61.8	41,250
C-II	Gulfstream III	136	77.8	68,700
D-I	Business Jets Learjet 35	143	39.5	18,300
D-II	Gulfstream II	141	68.8	65,300
D-II	Gulfstream IV	145	78.8	71,780

ALL WEATHER WIND COVERAGE

	12 MPH/10.5 Knots	15 MPH/13 Knots
Runway 2-20	81.3%	86.9%
Runway 11-29	86.3%	89.4%
Runways Combined	95.90%	98.3%



DATA STATION:

Colorado City Sewage Lagoons
Colorado City, Arizona
February 1981-December 1981



MAGNETIC VARIANCE
13.46° East (November 1998)

COLORADO CITY
MUNICIPAL AIRPORT

Aircraft performance declines as each of these factors increase. For Colorado City Municipal Airport, summertime temperatures and the airfield elevation are the primary factors in determining runway length requirements.

For calculating runway length requirements at Colorado City

Municipal Airport, airport elevation is 4,871 feet above mean sea level (MSL) and the mean maximum temperature of the hottest month is 92.9 degrees Fahrenheit. Runway 11-29 has an effective runway gradient of 0.08 percent. Runway 2-20 has an effective runway gradient of 0.78 percent.

TABLE 3C
Airfield Safety Area Dimensional Standards

	B-I	B-II	C-II
Runway Safety Area			
Width	120	150	400
Length Beyond Runway End	240	300	1,000
Object Free Area			
Width	250	500	800
Length Beyond Runway End	240	300	1,000
Runway Protection Zone ¹			
Inner Width	250	500	500
Outer Width	450	700	1,010
Length	1,000	1,000	1,700

Source: FAA Airport Design Software Version 4.2D

¹ One mile approach visibility minimums

Using the data specific to Colorado City Municipal Airport, runway length requirements for the various classifications of aircraft that may operate at the airport were examined using the FAA Airport Design computer program Version 4.2D which groups general aviation aircraft into several categories, reflecting the percentage of the fleet within each category and useful load of the aircraft. **Table 3D** summarizes FAA recommended runway lengths for Colorado City Municipal Airport.

Based upon the existing aircraft fleet operating at Colorado City Municipal Airport and the projected aircraft fleet

through the long term planning period, Colorado City Municipal Airport should be designed to accommodate corporate aircraft ranging up to ARC B-II. The appropriate FAA runway length planning category for aircraft within ARC B-II is "small airplanes with 10 or more passengers seats". At its present length of 6,300 feet, Runway 11-29 fully meets this FAA planning criteria.

For comparison, actual runway lengths requirements for common business jets within the planning ARC of B-II have been analyzed. For Cessna Citation jet aircraft runway length requirements vary by model but range between 4,700 feet to 5,500 feet for the Citation I,

Citation III, Citation V, and Citation VI. For the Cessna Citation II, runway length requirements can reach 7,600 feet. For Dassault Falcon aircraft, runway length requirements range from 5,300 to 5,600 feet. Considering these

actual runway length requirements and the FAA recommended runway lengths, no additional runway length is needed to serve the expected fleet mix through the planning period.

TABLE 3D

FAA Recommended Runway Length Requirements

Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	4,600 feet
95 percent of these small airplanes	6,100 feet
100 percent of these small airplanes	6,300 feet
Small airplanes with 10 or more passenger seats	6,300 feet
Large airplanes between 12,500 and 60,000 pounds	
75 percent of these large aircraft at 60 percent useful load	6,900 feet

Small Aircraft - Aircraft less than 12,500 pounds

Source:FAA Airport Design computer program Version 4.2A.

The appropriate FAA planning category for larger turboprop and business jet aircraft within ARCs C-I and C-II (such as the Gulfstream III), which may use the airport on a limited basis, is "75 percent of these larger aircraft at 60 percent useful load". As shown in the table, the FAA recommends a runway length of 6,900 feet for these aircraft. At 6,300, Runway 11-29 meets the runway length requirements of the majority of the aircraft within this category. In general, the existing runway length is sufficient for departures of these aircraft throughout most of the year, but are limited slightly during the summer months when payload or stage length of flights must be reduced to enable aircraft to takeoff in the available runway length. Before participating in a runway lengthening project, the City would need to demonstrate to the FAA that aircraft within ARCs C-I and C-II conduct at least 500 annual operations. As

mentioned previously, while the airport should experience a growing number of operations by more sophisticated general aviation aircraft, it is not expected that aircraft within ARCs C-I and C-II will conduct sufficient operations to meet the threshold of 500 annual operations as set forth by the FAA for an upgrade in planning standards and for additional runway length.

Runway Width

Runway width is primarily determined by the planning ARC for the particular runway. As discussed previously, a B-II ARC is appropriate for Runway 11-29 while a B-I ARC has been designated for Runway 2-20. Runway 11-29 is 75 feet wide and meets ARC B-II design standards which specify a runway width of 75 feet. Runway 2-20 is 60 feet wide and meets ARC B-I design standards

which specify a runway width of 60 feet. To accommodate aircraft within ARCs C-I and C-II on a regular basis, FAA design standards specify a runway width of 100 feet.

Runway Pavement Strength

The most important feature of airfield pavement is its ability to withstand repeated use by aircraft of significant weight. Presently, Runway 11-29 has a pavement strength rating of 30,000 pounds single wheel loading (SWL). This strength rating is sufficient for the full-range of business jet aircraft expected to operate at Colorado City Municipal Airport through the planning period unless the airport accommodates frequent operations by aircraft with more significant takeoff weights (such as the Gulfstream III which has a maximum takeoff weight of 69,700 pounds). The 12,500 pound strength rating of Runway 2-20 is sufficient for the mix of small aircraft which utilize the runway.

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield.

Presently, taxiway access is not available to any runway end. To access a particular runway end, aircraft must

“back-taxi” along the runway and turnaround in an area provided at the runway end. This practice reduces airfield capacity as landing aircraft must wait for the runway to clear of taxing aircraft and creates potential aircraft conflicts. To provide for safe, efficient access to each runway end, facility planning should include developing parallel taxiway access for each runway. A minimum of two exit taxiways (placed midway between each runway end and the runway intersections) should be planned for each runway.

Design standards for the separation distances between runways and parallel taxiways are based primarily on the planning ARC for each runway. For Runway 11-29, ARC B-II design standards specify a runway/taxiway separation distance of 240 feet. For Runway 2-20, ARC B-I design standards specify a runway/taxiway separation distance of 150 feet. For aircraft within Approach Category C, FAA design standards specify a runway/taxiway separation distance of 300 feet.

Taxiway width is determined by the Airplane Design Group (ADG) of the most demanding aircraft to use the taxiway. ADG II has been designated for all taxiways serving Runway 11-29 and the apron. ADG II specify a taxiway width of 35 feet. ADG I has been designated for taxiways serving Runway 2-20. ADG I standards specify a taxiway width of 25 feet.

The existing holding aprons/turnaround areas at each runway end provide an area for aircraft to prepare

for departure off the runway. These areas should be maintained through the planning period.

NAVIGATIONAL AIDS AND INSTRUMENT APPROACH PROCEDURES

Electronic navigational aids are in place to assist pilots in locating and landing at Colorado City Municipal Airport. The St. George very high frequency omnidirectional range (VORTAC)/TACAN facility, Colorado City nondirectional beacon (NDB), Loran-C, and Global Positioning System (GPS) navigational aids assist pilots during the enroute portion of their flight. The Colorado City NDB aids pilots in landing at the airport during poor weather conditions when following instrument approach procedures established by the FAA. The NDB-A approach enables aircraft with approach speeds less than 90 knots to land at the airport when cloud ceilings are as low as 900 feet above the ground and visibility is reduced to one mile. For aircraft with approach speeds between 91 and 120 knots, the visibility minimums increase to 1¼ miles. For aircraft with approach speeds between 121 and 140 knots, the visibility minimums increase to 2½ miles. At approach speeds between 141 and 165 knots, the visibility minimums increase to 2¾ miles.

A NAVAIDS study completed by the Arizona Department of Transportation, Aeronautics Division, plans for a GPS approach to Runway 29. Facility planning should include a GPS approach to Runway 11 as well. No

instrument approach procedures are necessary for Runway 2-20 since it serves primarily small aircraft during visual conditions.

Visibility and cloud ceiling minimums for an instrument approach procedure are dependent upon the extent that the airport meets specific on-airport requirements as summarized in **Table 3E** and approach requirements determined separately by the FAA. The NAVAIDS study being completed by the Arizona Department of Transportation, Aeronautics Division notes that terrain at an elevation of 5,098 feet 30,000 feet east of the airport may prevent the GPS approach to Runway 29 from providing lower than one mile visibility and 400-foot cloud ceiling minimums.

Future GPS instrument approach visibility minimums will be dependent upon the results of a FAA airspace analysis (to include a review of the terrain to the east) and the lighting aids and pavement markings in place at the airport. As shown in **Table 3E**, lower approach minimums require either SSALS or MALSR approach lighting and either nonprecision or precision runway markings.

LIGHTING AND MARKING

Currently, there are a number of lighting and pavement markings aids serving pilots using the Colorado City Municipal Airport. These lighting and marking aids assist pilots in locating the airport during night or poor weather conditions, as well as assist in the ground movement of aircraft.

Runway markings are designed according to the type of instrument approach available on the runway. FAA AC 150/5340-1F, *Marking of Paved Areas on Airports*, provides the guidance necessary to design an airport's mark-

ings. Each runway currently has basic markings which identify the runway centerline and designation. According to **Table 3E**, upgraded markings are needed for lower visibility GPS approaches.

TABLE 3E

GPS Instrument Approach Requirements

Requirement	One-Half Mile Visibility	$\frac{3}{4}$ Mile Visibility Greater Than 300-Foot Cloud Ceiling	One Mile Visibility Greater Than 400-Foot Cloud Ceiling
Minimum Runway Length	4,200 Feet	3,500 Feet	2,400 Feet
Runway Markings	Precision	Nonprecision	Visual
Runway Edge Lighting	Medium Intensity	Medium Intensity	Low Intensity
Approach Lighting	MALSR	SSALS	Not Required

Source: Appendix 16, FAA AC 150/5300-13, Airport Design, Change 5

MALSR - Medium Intensity Approach Lighting System with Runway Alignment Lighting
 SSALS - Simplified Short Approach Lighting System

Taxiway and apron areas also require marking to assure that aircraft remain on the pavement. Yellow centerline stripes are currently painted on all taxiway and apron surfaces at the airport to provide this guidance to pilots. Aircraft parking positions are also clearly marked on each apron area. Besides routine maintenance, these markings will be sufficient through the planning period.

Airport lighting systems provide critical guidance to pilots during nighttime and low visibility operations. Each runway is equipped with medium intensity runway edge lighting (MIRL). These systems are sufficient for any future GPS approaches and should be

maintained through the planning period.

Effective ground movement of aircraft at night is enhanced by the availability of taxiway lighting. Presently, medium intensity taxiway lighting (MITL) is in place at only the existing runway/taxiway intersections. Facility planning should include installing MITL along both taxiways connecting the runway and apron and around the perimeter of the apron and the holding aprons/turn-around areas. Future parallel and exit taxiways should be equipped with MITL as well.

The airport is equipped with a rotating beacon to assist pilots in locating the

airport at night. The existing rotating beacon is adequate and should be maintained in the future.

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, visual glideslope indicators (VGSI's) are commonly provided at airports. The type of VGSI available at the airport is the precision approach slope indicators (PAPIs) installed at the Runway 11 and 29 ends. Facility planning should include installing similar systems at the Runway 2 and 20 ends.

Approach lighting systems provide the basic means to transition from instrument flight to visual flight for landing. As shown in **Table 3E**, a simplified short approach lighting system (SSALS) is needed for $\frac{3}{4}$ mile visibility minimum GPS approaches. A medium intensity approach lighting system with runway alignment lighting (MALSR) is required for $\frac{1}{2}$ mile visibility minimum GPS approaches.

Runway end identifier lights (REIL) provide rapid and positive identification of the approach end of the runway. REILs are presently installed at the Runway 11 and 29 ends. These lighting aids are sufficient and should be maintained through the planning period.

The airport has a lighted wind cone and segmented circle which provides pilots with information about wind conditions and local traffic patterns. Each of these facilities should be maintained in the future.

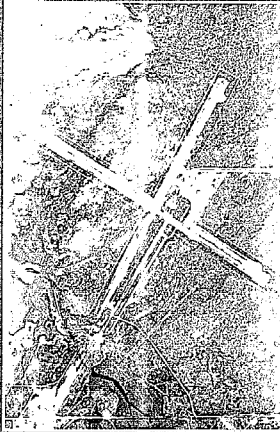
The AWOS-III is an important component to airfield operations as it notifies pilots of local weather conditions. This system should be maintained through the planning period and upgraded as needed.

CONCLUSIONS

A summary of the airfield facility requirements is presented on **Exhibit 3C**. The existing runway orientations, lengths, widths, and strengths are sufficient to serve the expected mix of aircraft through the planning period. Additional runway length, width, pavement strength, runway/taxiway separation distances, and safety areas are required should aircraft within ARCs C-I and C-II conduct more than 500 annual operations at the airport. Parallel taxiways should be planned for each runway to provide direct, safe, and efficient access to each runway end. Facility planning should include a GPS approach to Runway 11 in addition to the RNAV approach being established by the FAA and the GPS to Runway 29 currently included in the ADOT NAVAIDS study. A PAPI should be installed at the Runway 2 and 20 ends to enhance visual operations to these runways. GPS approaches with and lower than one mile visibility and 400 feet cloud ceiling minimums require upgraded runway markings and approach lighting aids.

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for handling of aircraft, passengers, and

RUNWAYS and TAXIWAYS**EXISTING****Runway 11-29**

6,300' x 75'
30,000 pounds SWL

Runway 2-20

5,100' x 60'
12,500 pounds SWL

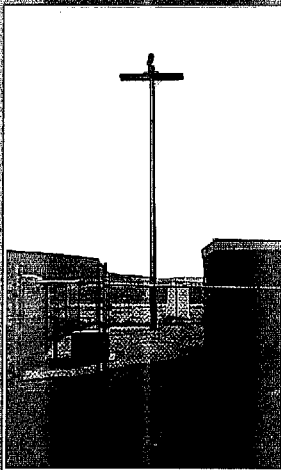
Holding Aprons/
Aircraft Turnarounds
Each End

SHORT TERM NEED

No Changes

LONG TERM NEED

Full-length Parallel
Taxiways and Runway
Exit Taxiways for
both Runways

***NAVIGATIONAL AIDS,
AIRFIELD LIGHTING,
and MARKINGS***

Rotating Beacon

Medium Intensity
Runway Lighting

Basic Runway Markings

NDB-A Instrument
Approach

Segmented Circle/
Lighted Windcone

AWOS-III

PAPIs Runways 11 and 29

REILs Runways 11 and 29

MITL Connecting
Taxiways, Holding Aprons/
Turnarounds

Global Positioning
System Approach to
Runway 29

PAPIs Runways 2 and 20

MITL Parallel and Exit
Taxiways

Global Positioning
System Approach to
Runway 11

MITL - Medium Intensity Taxiway Lighting
PAPI - Precision Approach Path Indicator
AWOS-III - Automated Weather Observation System
NDB - Nondirectional Beacon
REIL - Runway End Identification Lighting
SWL - Single Wheel Loading

COLORADO CITY
MUNICIPAL AIRPORT

freight while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs.

HANGAR, APRON AND TERMINAL REQUIREMENTS

Currently aircraft storage and maintenance is provided from a single 5,760 square-foot clearspan (conventional) hangar located along the east end of the apron. The Town Council has approved the development of an 8-unit T-hangar in 1998 along the north end of the T-hangar access taxiway.

Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is in more sophisticated (and consequently more expensive) aircraft. Therefore, many hangar owners prefer hangar space to outside tiedowns. For Colorado City Municipal Airport, the varying climate, which includes winter snow and ice, favors enclosed aircraft storage. Due to the unavailability of T-hangar space at the airport, all but one based aircraft currently tiedown outside. In the future, it is expected that more than half of based aircraft owners will desire enclosed aircraft storage.

Table 3F summarizes future hangar requirements for the airport. A planning standard of 1,200 square feet per based aircraft stored in T-hangars

has been used to determine future T-hangar requirements. A planning standard of 2,500 square feet for large aircraft stored in conventional hangars has been used to determine future conventional hangar requirements. Conventional hangar area was increased by 15 percent (plus 2,500 square feet) to account for future aircraft maintenance needs.

A parking apron should be provided for at least the number of locally-based aircraft that are not stored in hangars, as well as transient aircraft. Presently, 21 tiedowns are available for transient and based aircraft at the airport. A limitation of the present apron area is that the present tiedowns and taxilanes on the apron only provide sufficient area for aircraft within airplane design group I (wingspans up to 49 feet). With the airport accommodating ADG II aircraft on a regular basis (one business jet a week), larger parking positions and wider taxilanes to accommodate ADG II are needed.

Although the majority of future based aircraft were assumed to be stored in an enclosed hangar, a number of based aircraft will still tiedown outside. Total apron area requirements were determined by applying a planning criterion of 800 square yards per ADG I transient aircraft parking position and 650 square yards for each ADG I locally-based aircraft parking position (both include a factor for taxilanes). A planning standard of 1,600 square yards (parking position and taxilane requirements) was used to determine ADG II apron requirements. **Table 3G** summarizes future apron requirements for the airport.

TABLE 3F Aircraft Storage Hangar Requirements				
	Currently Available	Future Requirements		
		Short Term	Intermediate Term	Long Term
Aircraft to be Hangared		10	14	21
T-Hangar Positions	0	8	10	14
Conventional Hangar Positions	2-3	2	4	7
Conventional Hangar Area (s.f.)	5,760	8,300	14,000	21,100
T-Hangar Area (s.f.)	0	9,600	12,000	16,800
Total Hangar Area (s.f.)	5,760	17,900	26,000	37,900

TABLE 3G Aircraft Parking Apron Requirements				
	Currently Available	Short Term	Intermediate Term	Long Term
Transient Aircraft (ADG I) Positions		2	3	5
Apron Area (s.y.)		1,600	2,400	4,000
Transient Business Jet/Large Propellor Aircraft Positions (ADG II)		1	1	2
Apron Area (s.y.)		1,600	1,600	3,200
Locally-Based Aircraft (ADG I) Positions		6	7	9
Apron Area (s.y.)		3,900	4,600	5,900
Total Positions	21	9	11	16
Total Apron Area (s.y.) ¹	7,400	7,100	8,600	13,100
¹ Includes taxilanes				

Terminal building space is required for waiting passengers, pilot's lounge and flight planning, concessions, management, storage, and various other needs. The existing terminal building provides approximately 1,700 square feet of space for this purpose. Based on available terminal space and planning standards, the current terminal space is sufficient for existing and future passenger levels. Future terminal facility needs, however, will be a function of individual fixed based operator (FBO) needs. Generally, an FBO which constructs an aircraft

storage and maintenance hangar will construct pilot and passenger facilities adjacent to the hangar.

SUPPORT REQUIREMENTS

Various facilities that do not logically fall within classifications of airfield, terminal building, or general aviation areas have also been identified. These other areas provide certain functions related to the overall operation and safety of the airport and include: airport

access, vehicle parking, fuel storage, and aircraft rescue and firefighting.

Airport Access

Presently, the airport is accessed via Mohave Avenue and Redwood Street to Airport Avenue. The Town Transportation Plan includes extending Airport Avenue to State Highway 389 to provide direct access to the airport. No additional improvements are anticipated for the airport once Airport Avenue is extended to State Highway 389. Adequate signage from Highway 386 to the airport should be provided to aid transient users in locating the airport.

Vehicle Parking

Unpaved areas adjacent to the terminal and along both sides of the airport entrance road currently provide the only area for public and on-airport employee vehicle parking. Access to the apron is available for based aircraft owners. While this is adequate for current use, designated paved parking areas will be needed in the future to accommodate aircraft owners located in T-hangars and increased general aviation activity, especially corporate activity.

Terminal building vehicle parking requirements have been determined utilizing a planning standard of 1.3 spaces per design hour passengers and 400 square feet for each parking position (which includes a factor for drive lanes). Vehicle parking requirements for hangars and other aviation facilities at the airport were

determined as a percentage of based aircraft utilizing the same multiplier described above. **Table 3H** outlines vehicle parking requirements for the airport.

Fuel Storage

Presently, a 10,000 gallon above-ground tank provides 100LL aviation fuel storage. Jet-A fuel storage is provided by a mobile fuel truck owned by Westwing Aviation. A second mobile fuel truck (also owned by Westwing Aviation) provides for the dispensing of 100LL. Based upon available planning standards, the existing 100LL fuel storage is sufficient through the planning period; however, a similarly-sized tank should be provided for Jet-A fuel storage.

A growing trend at airports is the availability of self-service fueling. A self-service fueling system, known as a card lock system, allows aircraft owners to pump their own fuel using a credit card. This system has proven successful at many other airports as it reduces fuel costs to aircraft owners and allows for after-hours fueling.

Aircraft Rescue And Firefighting (ARFF)

The airport is not required to have aircraft rescue and firefighting equipment on the site, since there are no scheduled airline flights which would require the airport to operate under Federal Aviation Regulations (FAR) Part 139 standards.

TABLE 3H				
Vehicular Parking Requirements				
		Future Requirements		
	Currently Available	Short Term	Intermediate Term	Long Term
Design Hour Passengers		3	5	11
Terminal Vehicle Spaces ¹	Approx. 30	3	6	14
Parking Area (s.f.) ¹	Approx. 6,000	1,300	2,500	5,700
General Aviation Spaces ²	0	8	10	15
Parking Area (s.f.) ²	0	3,200	4,000	6,000
Total Parking Spaces	Approx. 30	11	16	29
Total Parking Area (s.f.) ³	Approx. 6,000	4,500	6,500	11,700
¹ Unpaved area along airport entrance road				
² Presently no designated parking areas adjacent to existing hangars				
³ Future requirements include drive lane requirements				

Fencing

Presently, much of the existing airport boundary is equipped with barb wire fencing. Chain link fencing is located along the airport entrance road. A manual gate is located at the entrance to apron to restrict access to apron and hangar areas. Chain link fencing should be considered for the entire airport boundary to prevent wildlife from inadvertently crossing aircraft operational areas. Manual and/or automatic gates should be located at all future entrances to hangar and apron areas.

Utilities

Presently, the airport is served by single-phase electrical service. Potable water is provided through a well located on airport property. Propane is used to heat the terminal. A septic tank is located at both the terminal and aircraft storage/maintenance hangar. A 60,000 gallon water tank supports the fire protection system which includes two fire hydrants located near the terminal and aircraft storage/maintenance

hangar. Future requirements include three-phase electrical service and the possibility of additional water storage for fire protection.

CONCLUSIONS

To accommodate forecast general aviation demand, enclosed T-hangar and conventional hangar space will be required through the planning period. The number of tie-downs and available apron area for aircraft within ADG-I appears to be sufficient for future growth. However, larger parking positions and apron taxilanes are needed to efficiently serve business jet aircraft within ADG-II. In the short term, this simply could be accomplished through remarking a portion of the existing apron. Paved parking areas adjacent to the terminal and future T-hangars will be needed through the planning period. Chain link fencing is needed to prevent wildlife from crossing airfield operational areas. Additional water storage may be required for fire protection as additional facilities are constructed at the airport. Existing


electrical service should be upgraded to three-phase service. Landside facility requirements are summarized on **Exhibit 3D**.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet


potential aviation demands projected for Colorado City Municipal Airport through the planning horizon. The next step is to develop a direction for development to best meet these projected needs. The remainder of the master plan will be devoted to outlining this direction, its schedule, and costs.

AIRCRAFT STORAGE HANGARS




	EXISTING	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
T-hangar Positions	0	8	10	14
Conventional Hangar Positions	2-3	2	4	7
T-hangar Area (s.f.)	0	9,600	12,000	16,800
Conventional Hangar Area (s.f.)	5,760	8,300	14,000	21,100
Total Hangar Area (s.f.)	5,760	17,900	26,000	37,900

APRON AREA



	EXISTING	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Transient Apron Positions (ADG I)	----	2	3	5
Transient Business Jet Positions (ADG II)	----	1	1	2
Locally-Based Aircraft Positions (ADG I)	----	6	7	9
Total Positions	21	9	12	17
Total Apron Area (s.y.)	7,400	7,100	8,600	13,100

VEHICLE PARKING



	EXISTING	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Terminal Vehicle Spaces ¹	Approx. 30	3	6	14
General Aviation Spaces ²	0	8	10	15
Total Parking Spaces	Approx. 30	11	16	29
Total Parking Area (s.f.)	Approx. 6,000	4,500	6,500	11,700

- 1) Unpaved areas along airport entrance road.
- 2) There are no designated parking areas adjacent to existing hangars.